

Pre-operative parathyroid localisation: surgical review of sesta-methoxyisobutylisonitrile images is important

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Abstract

Objective: To highlight the importance of pre-operative review of sesta-methoxyisobutylisonitrile imaging before parathyroid surgery.

Case report: Technetium-99 m sesta-methoxyisobutylisonitrile scanning is a well established imaging modality undertaken to locate the parathyroid glands prior to parathyroidectomy. Because of the relative lack of detail in the images obtained, the radiological report is normally the most important piece of information used by the surgeon for surgical planning. We report a case that illustrates the importance of surgical image review prior to revision parathyroid surgery. We also present a review of literature highlighting the need for surgical review of such imaging.

Conclusion: We propose that surgeons routinely review sesta-methoxyisobutylisonitrile images pre-operatively.

Key words: Technetium-99m-Sestamibi; Parathyroidectomy; Revision

Introduction

The literature suggests that approximately 85 per cent of individuals have four parathyroid glands, while approximately 5 per cent have more than four and approximately 5 per cent have less than four.¹ The parathyroid glands usually consist of a superior and an inferior pair. While the position of the superior pair is fairly constant within the fat posterior to the superior lobe of the thyroid (near the site where the recurrent laryngeal nerve enters the larynx), the inferior pair can be quite variable in location. They are usually found in close association with the inferior pole of the thyroid, but can be located anywhere from the level of the carotid bifurcation to the anterior mediastinum associated with the thymus.^{1,2}

Pre-operative localisation of abnormally functioning parathyroid tissue enables a focused approach to excision, especially for revision procedures. Radioisotope scanning with technetium-99 m sesta-methoxyisobutylisonitrile is widely employed for this purpose, prior to parathyroid surgery.³

We present the case of a patient with tertiary hyperparathyroidism who required revision parathyroidectomy, which highlights the importance of surgical review of sesta-methoxyisobutylisonitrile images.

Case report

A 72-year-old man with chronic renal failure requiring dialysis was referred to the ENT service with secondary hyperparathyroidism. His past medical history was significant for anaemia, hypertension and ischaemic heart disease requiring stenting.

The patient had undergone parathyroidectomy in 2005, with removal of the right and left superior parathyroid

glands (confirmed histologically). The inferior parathyroids had not been definitely identified, even after a level six clearance, exploration of the right and left carotid sheaths, and retro-oesophageal exploration. The patient's pre-, peri- and post-operative rapid parathyroid hormone (PTH) concentrations had been 1483, 215 and 176 pg/ml, respectively, suggesting successful control of hyperparathyroidism.

However, following a successful non-cadaveric renal transplant, the patient's serum calcium levels rose, and he was re-referred to the ENT service for revision parathyroidectomy.

A sesta-methoxyisobutylisonitrile scan, performed prior to revision surgery, was reported as showing increased tracer uptake below the left thyroid lobe consistent with a left inferior parathyroid adenoma. Presurgical review of these scans showed an area of uptake as reported by the radiologist. However, closer scrutiny by the surgeon revealed a smaller, subtle area of enhancement in the right chest (Figure 1).

At surgery, a hyperplastic left parathyroid gland was removed from the thyrothymic ligament area, and right transcervical thymectomy revealed a hyperplastic right parathyroid gland situated in the anterior mediastinum. Rapid PTH levels were 221, 167, and 55 pg/ml pre-, peri- and post-operatively, respectively (Table I).

Post-operatively, the patient was initially hypocalcaemic but stabilised with the help of calcium and vitamin D supplements, and was doing well at the most recent assessment.

Discussion

Hyperparathyroidism induced by chronic renal disease is one of the most serious complications for long-term haemodialysis patients. Parathyroidectomy is indicated in patients with severely advanced renal hyperparathyroidism refractory to medical treatment.

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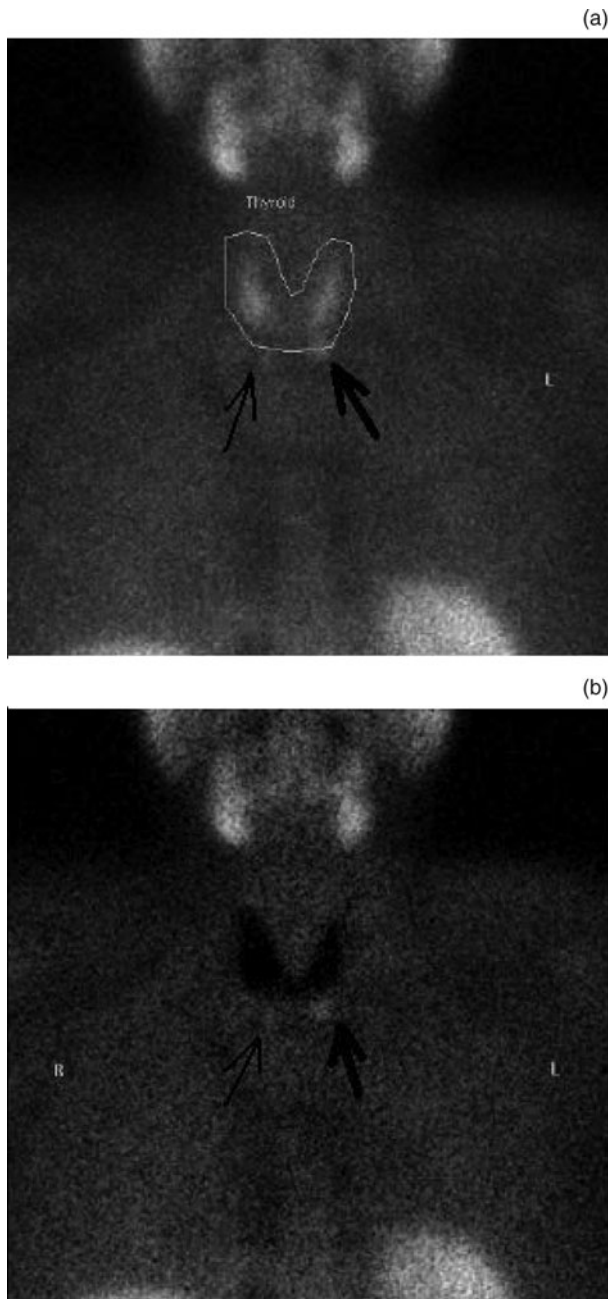


FIG. 1

Tc-99m sestamibi scan with thyroid gland (a) highlighted and (b) attenuated, showing the left inferior parathyroid gland (thick arrow) and a more subtle right parathyroid gland (thin arrow) in a retrosternal location.

TABLE I

PERI-OPERATIVE PARATHYROID HORMONE LEVELS

Procedure	PTH (ng/ml)		
	Pre-op	Peri-op	Post-op
Primary	1483	215	176
Revision	221	167	55

PTH = parathyroid hormone; pre-op = pre-operative; peri-op = peri-operative; post-op = post-operative

Tc-99m sestamibi scanning is now performed routinely for localisation of the parathyroids and is reasonably accurate, with a sensitivity of 70–99 per cent quoted in the literature.^{4–6} This may be supplemented by other imaging modalities (such as high resolution ultrasonography), intra-operative PTH monitoring, pre-operative methylene blue injection or the use of intra-operative technetium with a γ probe.^{2,7}

- **Tc-99m sestamibi scanning is widely employed in parathyroid surgery for organ localisation**
- **These authors emphasise the need for surgical review of images obtained**
- **Pre-operative surgical review of such images, in combination with radiological reporting, may improve parathyroidectomy outcomes**

Sesta-methoxyisobutylisocyanide scans can be difficult to interpret, as sesta-methoxyisobutylisocyanide is concentrated in several other tissues in the neck, including the salivary and thyroid glands. Abnormal parathyroid glands retain sesta-methoxyisobutylisocyanide longer than normal tissues or glands in the neck. Parathyroid surgeons usually rely on the radiologist’s report of such scans for crucial pre-operative information.⁸

There has been a previously reported case in which retrospective review of scan images showed ectopic glands at the level of the carotid bifurcation, glands which had initially been reported as submandibular glands.⁹ In the present case, prospective review of scan images altered surgical decision-making.

Conclusion

As a result of the reported case, we propose that thyroid surgeons should routinely review scan images pre-operatively and not rely solely on radiological reporting for gland localisation; such scrutiny may guide the surgical approach and enhance the outcome.

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